

REMARKS/ARGUMENTS

Claims 21-35 and 40-49 are pending in the present application. Applicant notes that Applicant's arguments filed 22 DEC 04 in Applicant's Appeal Brief with respect to the rejections of Claims 21-35 and 40-48 have been considered, deemed persuasive, and that the previous rejections have been withdrawn. Claim 49 had been allowed over the art then of record.

Currently, the status of the claims in the application is as follows:

Rejection 1

Claims 21-25, 40, 41, and 45-47 are rejected under 35 U.S.C. §103(a) as unpatentable over Graff et al., U.S. Patent No. 6,522,067, ("Graff") in view of Misiano et al., U.S. Patent No. 5,462,779, ("Misiano").

Rejection 2

Claims 26, 42, 43, and 48 are rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano and Baldo et al., U.S. Patent No. 6,097,147, ("Baldo").

Rejection 3

Claims 27, 28, 32, and 33 are rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano and Wolk et al., U.S. Patent No. 6,291,116, ("Wolk").

Rejection 4

Claims 29-31, and 44 are rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano and Collins, III et al., U.S. Patent No. 6,642,652, (“Collins”).

Rejection 5

Claim 34 is rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano, Baldo, and Wolk.

Rejection 6

Claim 35 is rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano, Baldo, Wolk, and Collins.

Rejection 7

Claim 49 is rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano and Iskanderova et al., U.S. Patent No. 5,683,757, (“Iskanderova”).

**I. Inadequacy of the Combination
of Graff and Misiano as a Basis
for Rejecting Any Claims**

Each of the seven rejections are based on obviousness over Graff in view of Misiano and, with the exception of Rejection 1, either one, two, or three additional patents. Basically, each of the seven rejections relies on the following two bases:

1. Graff for disclosing a light-emitting diode, or a method of making a light-emitting device, on a flexible transparent substrate having a barrier coating composed of one, or a combination, of a variety of materials and an organic EL layer disposed between two electrodes; and

2. Misiano for teaching a barrier layer for use on a flexible substrate composed of alumina and silica for which the composition varies continuously across the thickness of the layer.

In short, the examiner relies on Graff for disclosing a light emitting device such as an organic light emitting diode (“OLED”) coated with a barrier coating of metal oxides and Misiano for teaching a graded barrier layer having a continuously varying composition for use in a light emitting device.

As argued by Applicant in its Appeal Brief, Graff discloses a barrier stack that consists of a plurality of separate and distinct layers, each of which has a uniform composition. (*see* Appeal Brief dated 22 December 2004, pp. 4-5) The examiner agreed with Applicant’s argument and stated in the present Office Action “Graff fails to exemplify the barrier layer having a composition that varies continuously across its thickness.” (*see* Office Action dated 17 March 2005, p. 3) The examiner attempts to bridge this gap by combining the barrier layer taught in Misiano with the encapsulating barrier stack for an OLED taught by Graff. As will be shown, Graff and Misiano cannot be combined in this manner.

While the examiner’s statement is true regarding Graff failing to show or teach a barrier “layer” having a varying composition across its thickness, the examiner continues

to misread Graff and thereby misses the distinction in Graff between a **barrier layer** (a layer of a particular material) and a **barrier stack** (comprised of multiple layers, at least one of which is comprised of an organic material and at least one other which is comprised of an inorganic material). **It is fundamental to the understanding of Graff that one appreciate the difference between a “barrier layer” and a “barrier stack” as those terms are used by Graff.** The encapsulation of the OLED in Graff is accomplished by the application of a **barrier stack** over the light emitting layers, and not by applying just a barrier layer.

This misunderstanding of Graff appears to be the driving force behind the examiner’s attempt to combine Graff with Misiano. Graff and Misiano are each directed to solve a problem that is completely different and unrelated to the problem that the other attempts to solve.

The present application uses the term “coating” (*see* paragraph [0006] of the present application) to refer to the structure that is used for encapsulating the light-emitting device.

A. Misiano is Non-Analogous Art to Graff

Misiano is directed to an invention in an art that is non-analogous to the art necessary for the present application. Misiano teaches an “invention relat[ing] to an improved gas and water vapor permeation barrier for plastic film, particularly for use in the food industry . . .” (*emphasis added*) (Misiano col. 1 ll. 11-13 under the heading

“FIELD OF THE INVENTION”). This is further supported by the second object recited under the heading “OBJECTS OF THE INVENTION”, to wit, “provid[ing] a plastic film for food packaging and the like . . .” (*emphasis added*) (Misiano col. 1 ll. 59-60).

Additionally, under the heading “SUMMARY OF THE INVENTION”, Misiano repeatedly states that the film for which the barrier coating is applied is for the packaging of food (*see* Misiano col. 2 ll. 42-43, col. 3 ll. 10-13, col. 3 ll. 18-19).

Thus, Misiano teaches a barrier coating against oxygen and water vapor penetration for plastic packaging film for the food industry. However, packaging film used in the food industry is non-analogous art to barrier layers for light emitting devices such as organic light emitting diodes simply because the permeability requirements for light emitting devices are orders of magnitude more stringent than for the food industry.

One of skill in the art of barrier layers for light emitting devices would not consider barrier layers applied to packaging film for use in the food industry because of the huge disparity in permeability requirements. This disparity is shown in the table of Exhibit A, attached hereto. Misiano discloses, under the heading “SPECIFIC EXAMPLES”, the oxygen and water vapor permeability achievable for polyethyleneterephthalate (PET) film (*see* col. 4 ll. 32-53) and polyphenyleneoxide (PPO) film (*see* col. 5 ll. 1-18). The O₂ and H₂O permeability numbers disclosed by Misiano for various types of PET and PPO film are shown in the first two columns of numbers in Exhibit A. The next two columns of numbers are simply the conversion of the first two columns from (ml/100 in²-day) to (ml/m²-day) for columns 1 and 3, respectively, and from (g/100 in²-day) to (g/m²-day) for columns 2 and 4, respectively.

The last two columns of the table in Exhibit A show the standard permeability requirements for O₂ and H₂O in (ml/m²-day) and (g/m²-day), respectively, for light emitting devices (Graff teaches that the H₂O permeability requirement for OLEDs is 10⁻⁶ g/m²-day at col. 1 ll. 43-46) As can be seen from the table, the graded barrier layer applied to PET film displays a better permeability than the graded barrier layer applied to PPO film, but is still **more than 4000 times worse than the uppermost permeability limit for O₂ for light emitting devices and more than 150,000 times worse than the uppermost permeability limit for H₂O for light emitting devices.** Yet, the numbers provided by Misiano indicate that “the improved barrier coating of the invention has been found to markedly increase the resistance to penetration of the film by gases and vapors and especially to oxygen and water vapor . . .” (*emphasis added*) (see Misiano col. 2 line 65 to col. 3 line 1). Therefore, it is plainly obvious that Misiano is non-analogous art and that the barrier layer disclosed in Misiano will not be effective for use with light emitting devices.

**B. The Materials Used in the Barrier Layer
in Misiano are Different Than the Materials
Used in the Barrier Layer in the Present Application**

Those of skill in the art of barrier coatings for light emitting devices such as OLEDs know that in order for the barrier coating to be effective in preventing the infiltration of O₂ and H₂O, the barrier coating must comprise both an organic and an inorganic material. However, nowhere in Misiano is there disclosed, mentioned, or taught a barrier coating with both an organic and an inorganic material. Each and every

mention in Misiano of a barrier coating, whether single layer, multi-layer, or graded layer, the disclosed barrier coating comprises only inorganic materials.

For example, Misiano states: “A barrier coating against oxygen and water vapor penetration for a plastic packaging film comprising two oxides, one of which is SiO_2 while the other is Al_2O_3 .” (*Abstract*); “in accordance with the invention . . . a thin coating of at least one substance selected from the group which consists of SiO and SiO_2 , and, as another substance, Al_2O_3 . . .” (col. 2 ll. 10-12); “th[e] layer may have uniform distribution of the two oxide components throughout its thickness but preferably has a gradient . . .” (col. 2 ll. 18-20); “with the double oxide coating of the invention, thickness does not play a role . . .” (col. 2 ll. 31-32); “In Fig. 2, the film 20 is shown to have a single coating 21 thereon of both Al_2O_3 and SiO_2 . . .” (col. 3 ll. 58-59) (*see also* Figure 2 and Figure 3); and the oxygen and water vapor permeabilities given for the graded layer coating (see the table in Exhibit A) are for SiO_2 and Al_2O_3 coatings.

Therefore, since Misiano lacks any disclosure of barrier coatings comprising anything other than inorganic materials, and those of skill in the art know that a barrier coating for a light emitting device must comprise both an organic and an inorganic material, Misiano cannot be used either alone or in combination with Graff to show that the claims in the present application are anticipated or obvious.

II. Discussion of Specific Rejections

A. Rejection 1

Claims 21-25, 40, 41, and 45-47 are rejected under 35 U.S.C. §103(a) as unpatentable over Graff et al., U.S. Patent No. 6,522,067, (“Graff”) in view of Misiano et al., U.S. Patent No. 5,462,779, (“Misiano”). Claims 21, 40, and 47 are independent.

Regarding independent Claims 21 and 40, the examiner states that it would have been obvious to modify the “barrier layer” in Graff with the “continuously varying barrier layer of the same materials as Graff’s”, such as the barrier layer taught by Misiano.

In addition to the arguments presented above, Applicant notes that the examiner is confusing the term “barrier layer” and “barrier stack” as those terms are used in Graff. The “encapsulation” of an OLED, as described in Graff, is shown in Figure 1 and is described at col. 3 ll. 32-39:

One embodiment of the present invention is an encapsulated OLED 100 as shown in FIG. 1. The encapsulated OLED 100 includes substrate 105, a **first barrier stack 110**, an organic light emitting layer stack 120, and a **second barrier stack 130**. The **first barrier stack 110 has a first barrier layer 140** and two polymer layers 150, 160. The **second encapsulation layer 130 includes a second barrier layer 170** and two polymer layers 180, 190. (*emphasis added*)

It is the **barrier stack** that provides the encapsulation in Graff, and NOT the **barrier layer**. Those of skill in the art of encapsulating light emitting devices are aware that the barrier layer of Graff, by itself, is insufficient to prevent degradation of the light

emitting layers due to the infiltration of H₂O and/or O₂.

Merely substituting the inorganic barrier layer of Misiano for the **barrier layer** of Graff still results in a multilayered **barrier stack**. Claims 21 and 40, on the other hand, each recite, as amended, a “graded-composition barrier coating comprising an inorganic and an organic material, a composition of which varies substantially continuously across a thickness thereof”. A proper comparison of the encapsulation devices between Graff and/or a combination of Graff and Misiano with the language of Claims 21 and 40 require comparing the **barrier stack** in Graff and the **barrier coating** in Claims 21 and 40. It is obvious that Graff and/or a combination of Graff and Misiano does not render obvious Claims 21 and 40. Accordingly, withdrawal of the rejection of Claims 21 and 40 is respectfully solicited.

Claims 22-25 all ultimately depend from Claim 21 and should be allowable with Claim 21 without regard to the additional patentable limitations respectively contained therein. Claims 41, 45, and 46 all depend from Claim 40 and should be allowable with Claim 40 without regard to the additional patentable limitations respectively contained therein.

Independent Claim 47 is a method claim which recites, as amended, “depositing a first graded-composition barrier coating comprising an inorganic and an organic material on at least one of said substrate surface, a composition of said first barrier coating varying substantially continuously across a thickness thereof”. Similar to Claims 21 and 40, the examiner attempts to substitute the inorganic barrier layer of Misiano for the **barrier layer** of Graff which, as discussed above, still results in a multilayered **barrier stack**.

Therefore, for the previously-cited reasons, Claim 47 is not rendered obvious by a combination of Graff and Misiano. Accordingly, withdrawal of the rejection of Claim 47 is respectfully solicited.

B. Rejection 2

Claims 26, 42, 43, and 48 are rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano and Baldo et al., U.S. Patent No. 6,097,147, (“Baldo”).

The examiner applies the combination of Graff and Misiano to Claims 26, 42, 43, and 48 as for Rejection 1, above, and further relies on Baldo to teach a metal reflective layer formed over the light emitting layer as recited in Claims 26, 42, 43, and 48. Baldo does nothing to overcome the aforementioned defect in the combination of Graff and Misiano. Therefore, the rejection of Claims 26, 42, 43, and 48 cannot stand and withdrawal of the rejection of Claims 26, 42, 43, and 48 is respectfully solicited.

C. Rejection 3

Claims 27, 28, 32, and 33 are rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano and Wolk et al., U.S. Patent No. 6,291,116, (“Wolk”). Claim 33 is independent.

The examiner applies the combination of Graff and Misiano to Claims 27, 28, 32, and 33 as for Rejection 1, above, and further relies on Wolk to teach (a) an OLED having a layer of poly(n-vinylcarbazole) for the hole transporting layer for Claims 27 and 33, (b) the use of perylene as a dopant for the electron transporting layer for Claims 28 and

33, and (c) forming a hole transport layer between the anode and the emitter layer as well as forming a hole blocking layer and an electron blocking layer between the anode and the cathode and the emitting layer for Claim 32, as those limitations are recited in the respective Claims.

Wolk does nothing to overcome the aforementioned defect in the combination of Graff and Misiano. Therefore, the rejection of Claims 27, 28, 32, and 33 cannot stand and withdrawal of the rejection of Claims 27, 28, 32, and 33 is respectfully solicited.

D. Rejection 4

Claims 29-31, and 44 are rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano and Collins, III et al., U.S. Patent No. 6,642,652, (“Collins”).

The examiner applies the combination of Graff and Misiano to Claims 29-31, and 44 as for Rejection 1, above, and further relies on Collins to teach an LED having a phosphor for absorbing light emitted from the EL layer and re-emitting light of a different wavelength as recited in Claims 29-31, and 44. Collins does nothing to overcome the aforementioned defect in the combination of Graff and Misiano. Therefore, the rejection of Claims 29-31, and 44 cannot stand and withdrawal of the rejection of Claims 29-31, and 44 is respectfully solicited.

E. Rejection 5

Claim 34 is rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano, Baldo, and Wolk. Claim 34 is independent.

The examiner applies the combination of Graff and Misiano to Claim 34 as for Rejection 1, above, and further relies on Baldo to teach a metal reflective layer formed over the light emitting layer and Wolk to teach an OLED having a layer of poly(n-vinylcarbazole) for the hole transporting layer and the use of perylene as a dopant for the electron transporting layer, as recited in Claim 34. As discussed previously, neither Baldo nor Wolk, or any combination of Baldo and Wolk, overcomes the aforementioned defect in the combination of Graff and Misiano. Therefore, the rejection of Claim 34 cannot stand and withdrawal of the rejection of Claim 34 is respectfully solicited.

F. Rejection 6

Claim 35 is rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano, Baldo, Wolk, and Collins.

The examiner applies the combination of Graff and Misiano to Claim 35 as for Rejection 1, above, and further relies on Baldo to teach a metal reflective layer to reflect impinging light beams, Wolk to teach perylene and poly(n-vinylcarbazole) as materials for the light-emissive layers, and Collins to teach an LED having a phosphor for absorbing light emitted from the EL layer and re-emitting light of a different wavelength, as recited in Claim 35. As discussed previously, neither Baldo nor Wolk nor Collins, or any combination of Baldo, Wolk, and Collins, overcomes the aforementioned defect in the combination of Graff and Misiano. Therefore, the rejection of Claim 35 cannot stand and withdrawal of the rejection of Claim 35 is respectfully solicited.

G. Rejection 7

Claim 49 is rejected under 35 U.S.C. §103(a) as unpatentable over Graff in view of Misiano and Iskanderova et al., U.S. Patent No. 5,683,757, (“Iskanderova”). Claim 49 is independent.

The examiner applies the combination of Graff and Misiano to Claim 49 as for Rejection 1, above, and further relies on Iskanderova to teach deposition techniques for creating continuous, graded barrier coatings of metal oxides as recited in Claim 49.

Iskanderova does nothing to overcome the aforementioned defect in the combination of Graff and Misiano. Therefore, the rejection of Claim 49 cannot stand and withdrawal of the rejection of Claim 49 is respectfully solicited.

III. Discussion of New Claims

Claims 54-57 have been added to the application. Each of these new claims ultimately depend on Claim 21 which is allowable over the cited art as discussed above. Claims 54-57 further define the structure of the grade-composition barrier coating for an embodiment of the invention. Therefore, each of Claims 54-57 should be allowable with Claim 21 without regard to the additional patentable limitations contained respectively therein.


CONCLUSION

Claims 21-35 and 40-49 are pending in the present application and all the Claims stand rejected as obvious. As discussed in detail above, none of the Claims are obvious over the art cited and applied by the examiner. Withdrawal of all the rejections and allowance of Claims 21-35 and 40-49 is respectfully solicited. Allowance of new Claims 54-57 is also respectfully solicited.

Applicant appreciates the time taken by the examiner and her supervisor to meet and discuss the Office Action and proposed Response on 9 June 2005. While Applicant maintained, and continues to maintain, that one of skill in the art of electroluminescent devices would know that a barrier coating for an electroluminescent member would comprise an inorganic and an organic material, Applicant agreed to amend the independent claims in the current application to expressly state that limitation.

The Commissioner is hereby authorized to charge payment of any additional fees associated with this communication or credit any overpayment to Deposit Account No. 04-1679. A duplicate copy of this sheet is enclosed.

Respectfully submitted,



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